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Occult femoral neck fractures

Slapti šlaunikaulio kaklo lūžiai

Valentinas Uvarovas[1], Andrius Vaitiekus[2], Igoris Šatkauskas[1]

[1] *Clinic of Reumatology, Traumatology-Orthopedics and Reconstructive Surgery, Orthopedics and Traumatology Centre, Vilnius Universitety, Lithuania*
[2] *Republican Vilnius University Hospital, Orthopedics Department, Vilnius, Lithuania*
[1] *Reumatologijos, Traumatologijos-ortopedijos ir rekonstrukcinės chirurgijos klinika, Traumatologijos ir ortopedijos centras, Vilniaus universitetas*
[2] *Respublikinė Vilniaus universitetinė ligoninė*

Occult femoral neck fractures are becoming an urgent problem for aging population. In general the term "occult fracture" is used to denote fractures which are occult on plain radiographs, but found to be present on other imaging modalities or intra-operatively. Estimated incidence of occult femoral neck fracture is 2 to 10 per cent according to the literature. There is a risk of secondary fracture displacement, and other related complications in case of late diagnosis of these fractures. Timely diagnosis of these fractures in elderly patients improves treatment outcomes, reduces invalidity risk. The higher mortality rate is associated with well diagnosed femoral neck fractures whose treatment was delayed for reasons other than missing X-ray evidence of a fracture.

Keywords: computer tomography, hip X-ray, magnetic resonance imaging occult femoral neck fracture

Šlaunikaulio kaklo lūžiai, iš jų ir slapti, senstant populiacijai tampa aktualia problema. Literatūroje slaptų, arba okultinių, lūžių terminas vartojamas pažymėti tiems šlaunikaulio kaklo lūžiams, kurie diagnozuojami ne rentgenologiškai, o papildomais radiologiniais tyrimo metodais (KT, BMR) arba aptinkami operacijos metu. Literatūros duomenimis, slaptų šlaunikaulio kaklo lūžių dažnumas siekia nuo 2 iki 10 procentų visų šlaunikaulio kaklo lūžių. Laiku nediagnozavus šlaunikaulio kaklo lūžio išlieka antrinio lūžgalių poslinkio pavojus ir gresia komplikacijos, susijusios su pavėluota šių lūžių diagnostika. Dėl to daugėja neadekvataus pacientų gydymo atvejų ir didėja pacientų mirtingumas po šlaunikaulio kaklo lūžių. Kad būtų galima laiku aptikti slaptą šlaunikaulio kaklo lūžį, esant šiai patologijai būdingai anamnezei ir klinikiniams simptomams, indikuojama atlikti papildomus radiologinius tyrimus (KT ar BMR).

Reikšminiai žodžiai: kompiuterinė tomografija, klubo sąnario rentgeno nuotauka, branduolių magnetinis rezonansas

Introduction

The fractures that are diagnosed not by standard X-rays, but by other diagnostic radiologic studies or during surgery, are called in literature as occult or unseen fractures [10].

Literature data shows that 2 to 10 per cent of all cases are not diagnosed by primary X-rays [8]. There is a risk of secondary fracture displacement, and other related complications in case of late diagnosis of these fractures. This is important because the overall mortality during

the first year after proximal hip fracture is 14 to 36 per cent. If the surgical treatment is applied after more than 2 days following the injury, the death rate doubles. Timely diagnosis of these fractures in elderly patients improves treatment outcomes, reduces invalidisation risk [8]. The higher mortality rate is associated with well diagnosed femoral neck fractures whose treatment was delayed for reasons other than missing X-ray evidence of a fracture. Therefore it is important to carry out additional studies to confirm or reject the final diagnosis if there is a suspicion and the initial x-ray shows nothing.

We will present a clinical case to illustrate the difficulties in diagnosing these fractures.

Clinical case

A 73 year old woman applied due to pain in her left hip area. The patient said that she had fallen at home. After the trauma she could walk. During examination the left hip joint area was painful when rotating outward. The fracture was not diagnosed on the front both hips (Fig. 1) and left hip axial (Fig. 2) radiographs. A contusion of her left hip was diagnosed and the patient went home. After ten days pain in the left hip became very intense and the patient turned to the emergency department repeatedly. Computer tomography was done at once and it showed a left femur neck fracture (Fig. 3 and Fig. 4). Urgent osteosynthesis with Ullevaal screws was done (Fig. 5 and 6). The patient is still alive and walks without any help after one year from the operation.

Fig. 1. X-ray has not revealed a clear fracture

Fig. 2. X-ray has not revealed a clear fracture

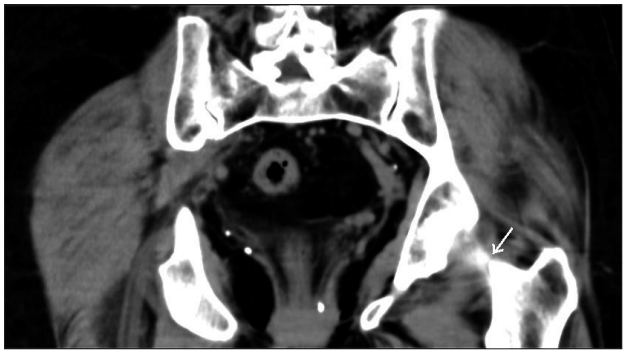

Fig. 3. Left femoral neck fracture (arrowed) visible on CT images

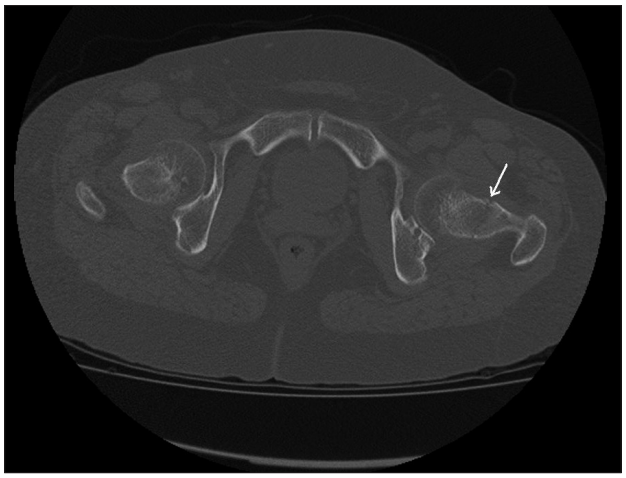

Fig. 4. Left femoral neck fracture (arrowed) visible on CT images

Fig. 5. Front left hip radiograph after the osteosynthesis

Fig. 6. Axial left hip radiograph after the osteosynthesis

Discussion

Occult femoral neck fractures most commonly occur in elderly persons who experienced low energy trauma (fall time). These fractures have characteristic signs and symptoms. The patients often complain of an inability to maintain body weight, painful straight leg raising and painful external and internal rotation. But these symptoms also occur due to degenerative hip changes in elderly patients. This can confuse and complicate the medical occult femoral neck fracture diagnosis [5, 13]. According to Hossain and other trials, painful axial load was monitored in 73 per cent, painful rotation in 70 per cent, and painful leg raise in 50 per cent of patients who had occult fractures. In the described cases, in which patients complained of hip pain, or just aches, there was no interference with their walking, and only an additional radiological examinations revealed femoral neck fractures [6]. Therefore, the occult femoral neck fracture may remain undiagnosed.

The medical history and clinic must be evaluated and the characteristic symptoms identified, the standard hip or pelvic radiographs must be used. Femoral neck is best viewed on front X-rays, rotating the leg inward. Always two radiographs must be done: the front of the pelvis and lateral (axial). The authors state that if the clinical symptoms of hip fracture have not been discovered by X-rays and characteristic fractures of changes, it is necessary to repeat the X-ray examination or use other radiological investigations (MRI, CT) [1, 7].

Another study says that X-ray can identify the invisible femoral neck fracture in adaptive imaging. The authors recommend to perform X-ray when the patient lying on his back, rotating the thigh outward, and then slowly rotating the thigh inward. In this way six front view radiographs can be done. If the patient feels a severe pain whenever possible, he must be examined by the x-ray machine. The authors state that this approach saves time and resources, because the method is inexpensive, lasts for 5 minutes and is quite effective. The study noted the importance of the investigator, assessor photo experience. With enough practice, this method can achieve good results in the diagnosis of occult femoral neck fractures [4].

The femoral neck fracture diagnostics is used in bone scintigraphy with radioactive technetium (Th99). The

method sensitivity is 98 per cent and specificity – only 68 per cent [1]. After the fracture it is recommended to wait for 3 days and then better results would be achieved. In the study above, especially on the first day after the injury, the study may not be sufficiently informative [9].

Magnetic resonance imaging is now recognized as one of the most accurate methods for the diagnosis of latent occult femoral neck fractures. Magnetic resonance imaging of soft tissue lesions diagnose more than computerized tomography. This study is more informative [9]. However, it should be noted that soft tissue damage can mask the fracture, which results in a worse diagnosis. Nevertheless, the authors believe that diminished magnetic resonance imaging possibilities because of its sensitivity and specificity are much higher. Nuclear magnetic resonance imaging sensitivity is 53 to 100 per cent and specificity 95 to 100 per cent [1–3, 9, 11, 12]. It was not disputed, that the standard study had to compare all the investigated diagnostic techniques, but it was possible, because the study was based on the selected case histories.

In assessing the above literature review, most authors offer magnetic resonance imaging as a primary method of occult femoral neck fracture diagnosis. Admittedly, this is a test with the highest sensitivity and specificity of the diagnosis of the pathology. However, in a unified chorus that supports this diagnostic tool, from time to time you hear conflicting voices. At present, too little research is done to illustrate the usefulness of computed tomography, opportunities and indications. Therefore, many of the developed algorithms do not exclude CT as the key diagnostic tool and recommend, if possible, to do one or the other study (magnetic resonance imaging or computed tomography).

Of course, standard radiographs are adaptable and adequate diagnostic tools, but they require a lot of experience. The determination of the hidden femoral neck fracture must be based on the medical history, clinical symptoms and radiological diagnostics. If typical clinical symptoms of osteoporosis in patients at risk are observed and radiographs do not provide sufficient information, it is necessary to suspect the invisible femoral neck fracture and perform other radiological tests to confirm the diagnosis (MRI or CT).

The higher mortality rate is associated with well diagnosed femoral neck fractures whose treatment was delayed for reasons other than missing X-ray evidence of a fracture. A complication such as avascular necrosis of the femoral head is bound to be higher in fractures diagnosed late and therefore treated with a delay.

Conclusions

In femoral neck fractures characteristic clinical symptoms in patients with additional risk factors for osteoporosis are suspected, but if not diagnosed after a standard radiological examination, it is necessary to perform additional diagnostic radiological examinations adjustment. Further study of choice in suspected femoral neck fracture, which is invisible, is magnetic resonance imaging, which must be done within 24 hours after the injury. If this method is not available, it is recommended to perform a computerized tomography study. Early targeted supplementary diagnostic radiology verifies a break and improves postoperative outcome and reduces the frequency of complications.

REFERENCES

1. Brunner LC, Eshilian-Oates L, Kuo DY. Hip fractures in adults. Am Fam Physician 2003; 67(2): 537–543.

2. Cabarrus MC, Ambekar A, Lu Y, Link TM. MRI and CT of insufficiency fractures of the pelvis and the proximal femur. AJR 2008; 191.

3. Frihagen F, Nordsletten L, Tariq R, Madsen JE. MRI diagnosis of occult hip fractures. Acta Orthopedica, 2005; 76 (4): 524–530.

4. Helland EB, Tollefsen I, Reksten G. Radiographic diagnosis of the occult hip fracture, experience in 16 patients. Acta Orthopedica 2000; 71(4): 639–641.

5. Hossain M, Akbar SA, Andrew G. Misdiagnosis of occult hip fracture is more likely in patients with poor mobility and cognitive impairment. Acta Orthop Belg 2010; 76(6): 341–346.

6. Hossain M, Barwick C, Sinha AK, Andrew JG. Is magnetic resonance imaging (MRI) necessary to exclude occult hip fracture? Injury 2007; 38: 1204–1208.

7. Lee YP, Griffith JF, Antonio GE, Tang N, Leung KS. Early magnetic resonance imaging of radiographically occult osteoporotic fractures of the femoral neck. Hong Kong Med J 2004; 10: 271–275.

8. Lubovsky O, Liebergall M, Mattan Y, Weil Y, Mosheiff R.

Early diagnosis of occult hip fractures MRI versus CT scan. Int. J Care Injured 2005; 36: 788–792.

9. Mayumi Oka and Johnny UV Monu. Prevalence and Patterns of Occult Hip Fractures and Mimics Revealed by MRI. AJR 2004; 182: 283–288.

10. Nachtrab O, Cassar-Pullicino VN, Lalam R, Tins B, Tyrrell PNM, Singh J. Role of MRI in hip fractures, including stress fractures, occult fractures, avulsion fractures. EJR 2012; 81: 3813–3823.

11. Rajkumar S, Orth D,Tay S. Clinical triad for diagnosing occult hip fractures with normal radiographs. The Internet Journal of Orthopedic Surgery 2006; 10: 5580/1139.

12. Rubin Itzik Malka and Nimrod Rozen. Should we operate on occult hip fractures? IMAJ 2010; 12: 316–317.

13. Verbeeten KM, Hermann KL, Hasselqvist M, Lausten GS, Joergensen P, Jensen CM Thomsen HS. The advantages of MRI in the detection of occult hip fractures. Eur Radiol 2005; 15: 165–169.